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PATENT SPECIFICATION

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(54) A METHOD AND APPARATUS FOR INHIBITING THE GROWTH OF SLIME-FORMING ORGANISMS IN PAPER MACHINES

(71) I, NORMAN WADDLETON, a British subject, of 57—58 Lincoln's Inn Fields, London, W.C.2, do hereby declare the invention, (a communication to me from abroad by DOSAB, of Norrangsvagen 21, 186 00 Vallentuna, Sweden, a Swedish Joint Stock Company duly organized under the Laws of Sweden), for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a method and apparatus for inhibiting and possibly preventing the growth of slime-forming organisms in the water-circulating system of paper machines.

A production problem of modern paper mills consists in the slime formed by micro-organisms.

Present-day paper machines are being provided for working at faster and faster rates. For working at such fast rates, it is necessary to enclose at least the wet part of the system, since high operating temperatures are required for satisfactory dehydration in the paper-making machines.

Also fibre-recovery systems are being enclosed for improvement of the recovery of fibres and the retention of the fibres and fillers in the fabrication process.

Present-day paper machines operate with nutrient rich water at 30—50°C, thereby providing excellent conditions for the growth of various micro-organisms. The micro-organisms living and developing in such a medium are usually most disadvantageous to paper production, and may have catastrophic consequences.

The slime arising in the water and paper masses of paper mills consists of billions of micro-organisms, particularly fungi and bacteria, which surround themselves with gelatine-like slime or produce such slime. Such colonies of micro-organisms adhere to fibres, sprayers and the like, and clumps can break loose from this slime to be deposited on the fine wire of the paper machine, thereby causing slime spots on the product. For efficient operation such contaminated paper must be eliminated.

In paper-making machines working at high speeds, such slime clumps can frequently cause breakages in the paper sheet, these breakages resulting in a substantial loss of production.

To combine these problems various kinds of bactericides and fungicides have already been used; various mercury compounds have had some affect, these mercury compounds not being excessively expensive. However, the use of mercury compounds produces a health hazard for man, and the use of phenylmercury has now been prohibited.

Before prohibition, phenylmercury was used for slime control. During operation of a paper machine, a certain amount of slime was allowed to develop and then phenylmercury introduced into the system. A typical dosage of phenylmercury was one dose per twenty-four hours or one dose for every ply. The dose was usually introduced at an early stage in the process, for example in the hollander.

By use of the phenylmercury it was possible to sufficiently control the growth of most species of micro-organisms, and to keep the paper mill sufficiently clean.

After the prohibition of phenylmercury, experiments were carried out with various kinds of compounds in search of a substitute.

It was necessary to find a substance which not only had the desired slime-inhibiting effect, but also was acceptable from an economic point of view. Furthermore the substance had to have no effect on the quality of the paper produced and also had to be free from adverse effects on men.

Substances are known with a static action, i.e. the substances do not kill the micro-organisms at a normal concentration but only prevent them from developing and establishing themselves.

[*Price 25p*]

By merely introducing such a substance into a system, it is necessary to produce an unnecessarily high concentration in the region where the substance is introduced so that the concentration at a remote point does not fall below an effective level. The high concentration of substance necessary at the point of introduction requires large quantities to be used, and therefore is an uneconomic use of expensive slime-inhibitors.

According to the present invention, there is provided, a method of inhibiting growth of slime-forming organisms in a paper-making machine, the method comprising dispensing slime-inhibiting doses at at least two metering points in the flow path of the water-flow system of the paper-making machine, each dose including a measured quantity of the same slime-inhibiting substance, the size of each dose and the spacing of the doses along the flow path being such that the concentration of said substance in the water-flow system is maintained above a slime-inhibiting level.

The method preferably includes controlling the quantity of slime-inhibiting substance in each dose by automatic control means.

The relative times at which the doses are dispensed at the metering points can be controlled, with advantage, by automatic time-control means.

According to the present invention, there is also provided apparatus for dispensing slime-inhibiting doses into a paper-making machine, the apparatus comprising means for supplying the slime-inhibiting substance included in each dose to at least two metering points in the flow path, the means including supply lines leading from a reservoir of the substance to the respective metering points, and valves for controlling the supply of substance to the metering points, said supply lines containing slime-inhibiting substance.

The apparatus preferably includes a pump for supplying the slime-inhibiting substance to the metering points at a rate independent of the number of metering points through which the substance is being dispensed at a given time.

Preferably, for efficient operation of the paper-making machine, the valves are arranged to be controlled by automatic control means. The automatic control means can be arranged to control the length of time for which each valve is arranged to be opened, and/or the automatic control means can be arranged to control the relative phases of opening of the valves.

The present invention can result in a reduction in the costs of inhibiting the growth of slime in a paper-making machine.

The invention will be further described, by way of example, with reference to the accompanying drawings, of which:—

Figure 1 shows diagrammatically an apparatus according to the invention;

Figure 2 is a diagram illustrating the introduction of a slime-control substance at only one point in a system; and

Figure 3 is a diagram illustrating the introduction of a slime-control substance at a plurality of metering points, according to the invention.

As shown in Figure 1, the apparatus includes a tank T for storing the substance which is to be dispensed; a pipe-line L extends from the storage tank T through a pump P to a control unit C which includes six magnetic valves numbered 1 to 6. From each magnetic valve, a pipe-line leads to a respective metering point D which is arranged in the flow path of the water system of a paper machine (not shown). The metering points can also be arranged along the wet end (where the paper pulp contains much water) of the paper-making machine.

The apparatus includes a controller A which is arranged automatically to control the magnetic valves in accordance with desired control parameters. The controller A may be constructed to control the valves so that each dose is dispensed with the desired volume of slime-inhibiting substance, and furthermore the time intervals between doses at the metering points can be controlled. The controller A can be arranged to operated so that the amounts of each dose, and the frequency of each dose can be varied for the various metering points.

In the graph of Figure 2 the concentration of slime-inhibiting substance in the paper-making machine is indicated by the solid line, the X-axis representing position along the machine and the Y-axis the concentration of slime-inhibiting substance. The horizontal dotted line Z represents minimum level of concentration which is necessary for sufficient slime control. As shown in Figure 2, an unnecessarily high concentration of slime-inhibiting substance must be dispensed at metering point D in order that the concentration remains above the level Z at a point remote from D.

The graph of Figure 3 shows the concentration of slime-inhibiting substance in a similar way. Quantities of slime-inhibiting substance are dispensed at metering points D1 to D4. It is arranged, through suitable setting of the controller A, that the amount of substance dispensed at each metering point is such that the concentration level is raised sufficiently far above the level Z so that the concentration falls to a value just above the Z-level just upstream of the next metering point.

The volume of slime-inhibiting substance

required for operation in accordance with the invention will be substantially less than the volune of substance required for operation with a single dose. Furthermore, the concentration of slime-inhibiting substance at no time in the machine increases greatly above the Z level when operating in accordance with the invention, whereas the opposite is the case when operating with a single dose. This can be especially advantageous where increasing the concentration of slime-inhibiting substance has a detrimental effect on the product or on the machine operators.

The pump P is preferably arranged to supply the slime-inhibiting substance at a constant rate independently of the number of metering points dispensing the substance at a given time.

The magnetic valves 1 to 6 are connected to a time-keeper or step-by-step change-over switch B to control the dispensing of doses so that the doses are dispensed in the correct succession relative to one another and at the correct point in time. The length of time between successive openings of the same valve will be the same for all the valves, although the length of time for which a particular valve is maintained in an open position may differ from other valves.

WHAT I CLAIM IS:—

1. Apparatus for dispensing slime-inhibiting doses into a paper-making machine, the apparatus comprising means for supplying the slime-inhibiting substance included in each dose to at least two metering points in the flow path, the means including supply lines leading from a reservoir of the substance to the respective metering points, and valves for controlling the supply of substance to the metering points, said supply lines containing slime-inhibiting substance.

2. Apparatus as claimed in claim 1, arranged to operate substantially as herein described with reference to and as shown in Figure 3 of the accompanying drawings.

3. A method of inhibiting growth of slime-forming organisms in a paper-making machine, the method comprising dispensing slime-inhibiting doses at at least two metering points in the flow path of the water-flow system of the paper-making machine, each dose including a measured quantity of the same slime-inhibiting substance, the size of each dose and the spacing of the doses along the flow path being such that the concentration of said substance in the water-flow system is maintained above a slime-inhibiting level, the slime-inhibiting substance being stored in a reservoir which feeds all the metering points.

4. A method of inhibiting the growth of slime-forming organisms in a paper-making machine as claimed in claim 3, and substantially as herein described with reference to the accompanying drawings.

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1263916 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

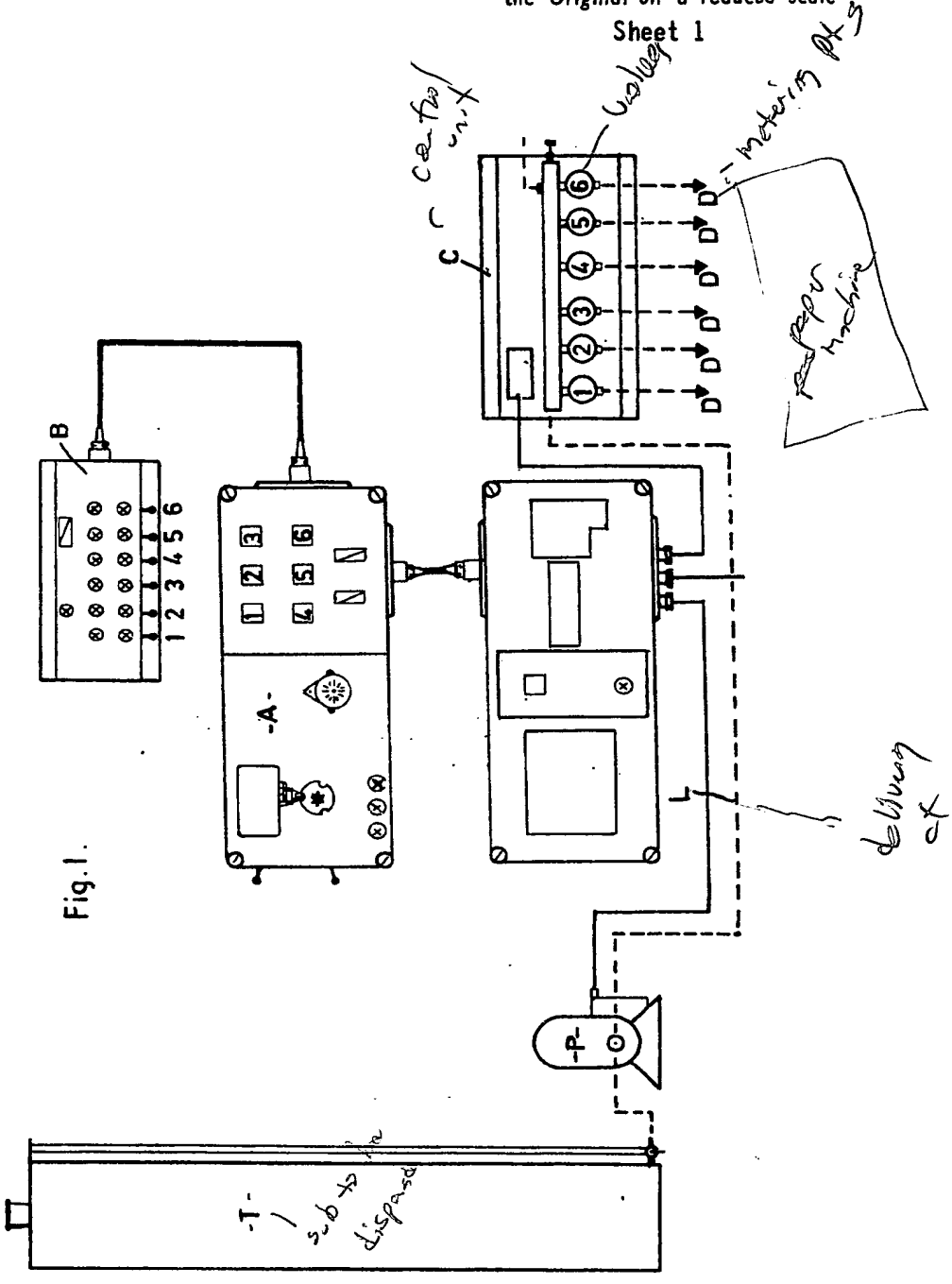

Fig. 1.

1263916 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

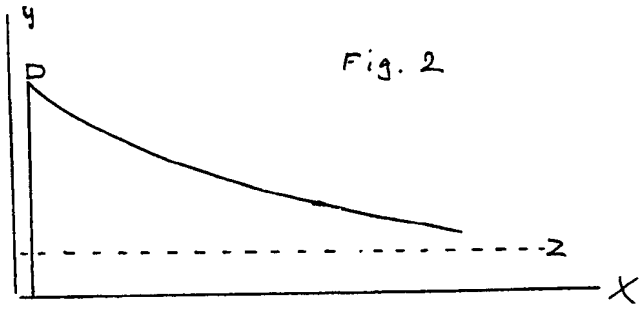

Fig. 2

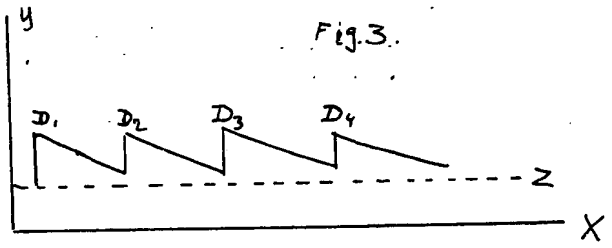

Fig. 3.